sinusoidal waveform. Accordingly, the degree of freedom in the value of lead angle γ increases, it is possible to realize γ=90°, and it is possible to further improve the efficiency.

Page 31, lines 5-13, please amend the paragraph to read as follows:

(9) If the configuration is made as stated in the tenth aspect, in accordance with the value of the angle γ, it is possible to make the machine operate as a 3-phase stepping motor or as a 3-phase brushless motor. Accordingly, in accordance with the load, it is possible to cope with the load by an optimum kind of motor by making the motor operate as a 3-phase stepping motor or a 3-phase brushless motor. Thus, convenience in use, improvement in general characteristic of a motor suited for the load, and improvement in economical point can be obtained.

IN THE CLAIMS

Please cancel Claims 1-10 without prejudice.

Please add new Claims 11-44 as follows:

11. (New) A motor-driven system comprising:

a rotational electric machine including,

a stator having an annular magnetic substance, main poles extending radially outward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an outer rotor type permanent magnet rotor having north (N) and south (S) magnetic poles arranged alternately on an inner circumference of said rotor and in a rotating direction of said rotor, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body directly mounted on said rotor to directly drive a load that contacts an outer circumference thereof.

12. (New) A motor-driven system comprising:

a rotational electric machine including,

a stator having an annular magnetic substance, main poles extending radially outward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an outer rotor type rotor constituted by a magnetic substance having magnetic teeth formed on an inner circumference thereof, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body directly mounted on said rotor to directly drive a load that contacts an outer circumference thereof.

13. (New) A motor-driven system comprising:

a rotational electric machine including,

a stator having an annular magnetic substance, main poles extending radially outward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an outer rotor type permanent magnet rotor having north (N) and south (S) magnetic poles arranged alternately on an inner circumference of said rotor and in a rotating direction of said rotor, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body mounted on said rotor through an output portion of a reduction gear to directly drive a load that contacts an outer circumference thereof,

wherein a rotation axis of said output portion is concentric with a rotation axis of said rotational electric machine.

14. (New) A motor-driven system comprising:

a rotational electric machine including,

a stator having an annular magnetic substance, main poles extending radially outward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an outer rotor type rotor constituted by a magnetic substance having magnetic teeth formed on an inner circumference thereof, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body mounted on said rotor through an output portion of a reduction gear to directly drive a load that contacts an outer circumference thereof,

wherein a rotation axis of said output portion is concentric with a rotation axis of said rotational electric machine.

15. (New) The motor-driven system according to one of Claims 11 to 14, wherein said stator has a 3-phase winding structure.

16. (New) The motor-driven system according to one of Claims 11 to 14, wherein a voltage to be applied to said rotational electric machine is stepped up/down by chopping.

17. (New) The motor-driven system according to one of Claims 11 to 14, wherein a phase of current relative to a motional electromotive force of said rotational electric machine is controlled.

18. (New) The motor-driven system according to one of Claims 11 to 14, wherein positional information of said rotor is obtained to thereby obtain timing of excitation of windings.

19. (New) The motor-driven system according to one of Claims 11 to 14, wherein said rotational electric machine is excited by 3-phase AC current excitation, microstep

excitation, or full step excitation such that an axis of a rotating magnetic field is advanced by γ degrees with respect to a magnetic pole position of said rotor.

20. (New) The motor-driven system according to Claim 19, wherein the value of γ is equal to 90° (γ-90°) in terms of electrical angle.

21. (New) The motor-driven system according to Claim 19, wherein the value of γ is in a range of $0 < \gamma \leq 90°$ and said motor is driven as an open loop stepping motor.

22. (New) The motor-driven system according to Claim 19, wherein the value of γ satisfies $\gamma > 90°$ and said motor is driven as a closed loop blushless motor.

23. (New) A motor-driven system comprising:

a rotational electric machine including,

a stator having an annular magnetic substance, main poles extending radially inward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an inner rotor type permanent magnet rotor having north (N) and south (S) magnetic poles arranged alternately on an outer circumference of said rotor and in a rotating direction of said rotor, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein a voltage to be applied to said rotational electric machine is stepped up/down by chopping.

24. (New) A motor-driven system comprising:

a rotational electric machine including,

a stator having an annular magnetic substance, main poles extending radially inward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an inner rotor type rotor constituted by a magnetic substance having magnetic teeth formed on an outer circumference thereof, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein a voltage to be applied to said rotational electric machine is stepped up/down by chopping.

25. (New) A motor-driven system comprising:

a rotational electric machine of a 3-phase HB type, including,

a stator having an annular magnetic substance, main poles extending radially inward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an inner rotor HB type rotor in which the number of rotor teeth is P, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein $P=m(3n\pm1)$ in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or $P=k(6n\pm1)$ in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1, and

wherein a voltage to be applied to said rotational electric machine is stepped up/down by chopping.

26. (New) A motor-driven system comprising:

a rotational electric machine including,

a stator having an annular magnetic substance, main poles extending radially inward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an inner rotor type permanent magnet rotor having north (N) and south (S) magnetic poles arranged alternately on an outer circumference of said rotor and in a rotating direction of said rotor, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein a phase of current relative to a motional electromotive force of said rotational electric machine is controlled.

27. (New) A motor-driven system comprising:

a rotational electric machine including,

a stator having an annular magnetic substance, main poles extending radially inward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an inner rotor type rotor constituted by a magnetic substance having magnetic teeth formed on an outer circumference thereof, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein a phase of current relative to a motional electromotive force of said rotational electric machine is controlled.

28. (New) A motor-driven system comprising:

a rotational electric machine of a 3-phase HB type, including,

a stator having an annular magnetic substance, main poles extending radially inward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an inner rotor HB type rotor in which the number of rotor teeth is P, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein $P=m\ (3n\pm1)$ in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or $P=k\ (6n\pm1)$ in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1, and

wherein a phase of current relative to a motional electromotive force of said rotational electric machine is controlled.

29. (New) A motor-driven system comprising:

a rotational electric machine including,

a stator having an annular magnetic substance, main poles extending radially inward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an inner rotor type permanent magnet rotor having north (N) and south (S) magnetic poles arranged alternately on an outer circumference of said rotor and in a rotating direction of said rotor, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein positional information of said rotor is obtained to thereby obtain timing of excitation of windings.

30. (New) A motor-driven system comprising:

a rotational electric machine including,

a stator having an annular magnetic substance, main poles provided extending radially inward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an inner rotor type rotor constituted by a magnetic substance having magnetic teeth formed on an outer circumference thereof, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein positional information of said rotor is obtained to thereby obtain timing of excitation of windings.

31. (New) A motor-driven system comprising:

a rotational electric machine including,

a stator having an annular magnetic substance, main poles extending radially inward from said magnetic substance, windings wound on said main poles respectively, and

inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an inner rotor type permanent magnet rotor having north (N) and south (S) magnetic poles arranged alternately on an outer circumference of said rotor and in a rotating direction of said rotor, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein said rotational electric machine is excited by 3-phase AC current excitation, microstep excitation, or full step excitation such that an axis of a rotating magnetic field is advanced by γ degrees with respect to a magnetic pole position of said rotor.

32. (New) A motor-driven system comprising:

a rotational electric machine including,

a stator having an annular magnetic substance, main poles extending radially inward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an inner rotor type rotor constituted by a magnetic substance having magnetic teeth formed on an outer circumference thereof, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof, said rotational electric machine is excited by 3-phase AC current excitation, microstep excitation, or full step excitation such that an axis of a rotating magnetic field is advanced by γ degrees with respect to a magnetic pole position of said rotor.

33. (New) A motor-driven system comprising:

a rotational electric machine of a 3-phase HB type including,

a stator having an annular magnetic substance, main poles extending radially from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an HB type rotor in which the number of rotor teeth is P, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein $P=m(3n\pm1)$ in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or $P=k(6n\pm1)$ in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1, and

wherein positional information of said rotor is obtained to thereby obtain timing of excitation of windings.

34. (New) A motor-driven system comprising:

a rotational electric machine of 3-phase PM type, including,

a stator having an annular magnetic substance, main poles extending radially from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

a cylindrical permanent magnet type rotor that is magnetized into north (N) and south (S) magnetic poles alternatively in which the number of rotor poles is 2P, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein $P=m(3n\pm1)$ in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or $P=k\ (6n\pm1)$ in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1, and

wherein positional information of said rotor is obtained to thereby obtain timing of excitation of windings.

35. (New) A motor-driven system comprising:

a rotational electric machine of a 3-phase HB type, including,

a stator having an annular magnetic substance, main poles extending radially from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an HB type rotor in which the number of rotor teeth is P, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body driven by an output of said rotor to directly drive a load that contacts an outer circumference thereof,

wherein $P=m\ (3n\pm1)$ in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or $P=k\ (6n\pm1)$ in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1, and

wherein said rotational electric machine is excited by 3-phase AC current excitation, microstep excitation, or full step excitation such that an axis of a rotating magnetic field is advanced by γ degrees with respect to a magnetic pole position of said rotor.

36. (New) A motor-driven system comprising:

a rotational electric machine of 3-phase PM type, including,

a stator having an annular magnetic substance, main poles extending radially from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

a cylindrical permanent magnet type rotor that is magnetized into north (N) and south (S) magnetic poles alternatively in which the number of rotor poles is 2P, said stator and said rotor being in opposition to each other while an air gap is held therebetween; and

an outer rotating body mounted on said rotor to directly drive a load that contacts an outer circumference thereof,

wherein $p=m(3n\pm1)$ in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or $P=k\ (6n\pm1)$ in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1, and

wherein said rotational electric machine is excited by 3-phase AC current excitation, microstep excitation, or full step excitation such that an axis of a rotating magnetic field is advanced by γ degrees with respect to a magnetic pole position of said rotor.

37. (New) A motor-driven system comprising:

a rotational electric machine of a 3-phase HB type, including,

a stator having an annular magnetic substance, main poles extending radially inward from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an inner rotor HB type rotor in which the number of rotor teeth is P, said stator and said rotor being in opposition to each other while an air gap is held therebetween,

wherein $P=m(3n\pm1)$ in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or $P=k(6n\pm1)$ in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1, and

wherein a phase of current relative to a motional electromotive force of said rotational electric machine is controlled.

38. (New) A motor-driven system comprising:

a rotational electric machine of a 3-phase HB type, including,

a stator having an annular magnetic substance, main poles extending radially from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an HB type rotor in which the number of rotor teeth is P, said stator and said rotor being in opposition to each other while an air gap is held therebetween,

wherein $P=m(3n\pm1)$ in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or $P=k(6n\pm1)$ in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1, and

wherein positional information of said rotor is obtained to thereby obtain timing of excitation of windings.

39. (New) A motor-driven system comprising:

a rotational electric machine of 3-phase PM type, including,

a stator having an annular magnetic substance, main poles extending radially from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

a cylindrical permanent magnet type rotor that is magnetized into north (N) and south (S) magnetic poles alternatively in which the number of rotor poles is 2P, said stator and said rotor being in opposition to each other while an air gap is held therebetween,

wherein $P=m(3n\pm1)$ in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or $P=k(6n\pm1)$ in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1, and

wherein positional information of said rotor is obtained to thereby obtain timing of excitation of windings.

40. (New) A motor-driven system comprising:

a rotational electric machine of a 3-phase HB type, including,

a stator having an annular magnetic substance, main poles extending radially from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

an HB type rotor in which the number of rotor teeth is P, said stator and said rotor being in opposition to each other while an air gap is held therebetween,

wherein $P=m\ (3n\pm1)$ in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or $P=k\ (6n\pm1)$ in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1, and

wherein said rotational electric machine is excited by 3-phase AC current excitation, microstep excitation, or full step excitation such that an axis of a rotating magnetic field is advanced by γ degrees with respect to a magnetic pole position of said rotor.

41. (New) A motor-driven system comprising:

a rotational electric machine of 3-phase PM type, including,

a stator having an annular magnetic substance, main poles extending radially from said magnetic substance, windings wound on said main poles respectively, and inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of said main poles, and

a cylindrical permanent magnet type rotor that is magnetized into north (N) and south (S) magnetic poles alternatively in which the number of rotor poles is 2P, said stator and said rotor being in opposition to each other while an air gap is held therebetween,

wherein $P=m(3n\pm1)$ in which m is the number of main poles of the stator for each phase and an integer not smaller than 1, or $P=k(6n\pm1)$ in which 2k is the number of main poles of the stator for each phase and each of k and n is an integer not smaller than 1, and

wherein said rotational electric machine is excited by 3-phase AC current excitation, microstep excitation, or full step excitation such that an axis of a rotating magnetic field is advanced by γ degrees with respect to a magnetic pole position of said rotor.

42. (New) The motor-driven system according to one of Claims 31, 32, 35, 36, 40 and 41, wherein the value of γ is equal to 90° ($\gamma=90°$) in terms of electrical angle.

43. (New) The motor-driven system according to one of Claims 31, 32, 35, 36, 40 and 41, wherein the value of γ is in a range of $0<\gamma\leq 90°$ and said motor is driven as an open loop stepping motor.

44. (New) The motor-driven system according to one of Claims 31, 32, 35, 36, 40 and 41, wherein the value of γ satisfies $\gamma>90°$ and said motor is driven as a closed loop blushless motor.

REMARKS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 11-44 are pending in the present application. Claims 1-10 have been canceled and Claims 11-44 have been added by the present amendment.

In the outstanding Office Action, the drawings were objected to; Claims 1-10 were rejected under 35 U.S.C. §112, first and second paragraphs; Claims 1 and 4 were rejected under 35 U.S.C. §102(b) as anticipated by Asai et al; Claim 2 was rejected under 35 U.S.C. §103(a) as unpatentable over Asai et al in view of Nakagawa; Claim 3 was rejected under 35 U.S.C. §103(a) as unpatentable over Asai et al in view of Seguchi et al; Claim 5 was rejected under 35 U.S.C. §103(a) as unpatentable over Asai et al in view of Arnaud et al and ordinary skill in the art; and Claims 6-10 were rejected under 35 U.S.C. §103(a) as unpatentable over Asai et al, Nakagawa and ordinary skill in the art.

Regarding the objection to the drawings, the new claims do not include a battery disclosed in original Claim 5. Accordingly, it is respectfully requested the objection to the drawings be withdrawn.

Further, regarding the rejection of Claims 1-10 under 35 U.S.C. §112, first paragraph, the outstanding Office Action also indicates the specification is not clear enough as to how a chopping would be performed to the battery unit in order to step down/up the voltage and questions whether the chopping circuit is used or is the electrical machine performing the voltage changes to the battery. Further, the outstanding Office Action indicates the formulas disclosed in Claim 3, for example, are not clear enough as to how the use of such formulas affect the electrical machine and questions the limits of the values that may be entered into the formulas.

Applicant respectfully submits the specification is sufficiently clear enough for a person skilled in the art as evidenced by Arnaud et al (cited by the outstanding Office Action) that discloses choppers D and E for controlling the applied voltage. That is, chopping control is a well-known technique in the art. In addition, the formulas disclosed in original Claims 5-

8 define the construction of the three-phase motor. The relationship between the number of the rotor teeth P and voltage V is described in equation (3) at page 20 of the specification. Further, the number of rotor teeth P is proportional to the torque T of the motor as shown in equation (1) at page 17 of the specification. In the motor described in new Claims 11 and 12, because the inductors are formed on each main pole of the stator, a step angle becomes smaller than that of a conventional motor that does not have inductors, which increases the torque of the motor. Therefore, the claimed motor-driven system is able to directly drive a tire, for example, of an electrical car. The new claims also do not include phrases such as "or the like" or "such as" nor include a broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation.

Accordingly, it is respectfully requested the rejection of Claims 1-10 under 35 U.S.C. §112, first paragraph, be withdrawn.

Regarding the rejection of Claims 1-10 under 35 U.S.C. § 112, second paragraph, new Claims 11-44 have been drafted in light of the comments noted in the outstanding Office Action and as shown in the marked-up copy. Further, the outstanding Office Action questions what is meant by having an outer rotating body mounted on an outer portion or on a side portion and questions how are the main poles provided so as to extend from the magnetic substance. The outstanding Office Action also questions how are the formulas in Claim 5 affecting the voltage of the battery, indicates 2k is disclosed to be the number of main poles, but such variable does not exist in the formulas, questions how is the positional information of the rotor obtained in Claim 7 and what specific device is performing such tasks, and notes variables 3m and 6k are not defined in the formulas.

Applicant notes the function of the outer rotating body is now recited in new Claims 11 and 12. The outer rotating body is directly mounted on the rotor to directly drive a load that connects an outer circumference thereof as recited in new Claims 11 and 12. For

example, when the outer rotating body is a tire of an electrical car, the tire directly drives on a road (driving an electric car as a reaction). The outer rotating body is located at one location. Main poles are formed so as to extend from a magnetic substance as a result. The main poles do not actually get longer from the substance. In addition, 2k is a number of main poles in a stator. As shown at page 19 of the specification, $P = k(6n\pm1)$ is determined by $P = 2k(6n\pm1)/2$. In addition, in original Claim 7, the positional information of the rotor can be obtained by a well-known sensor. As described in lines 10-12 at page 28 of the specification, an optical encoder or a resolver system in which a change of inductance is converted into a change of voltage may be used.

Accordingly, it is respectfully requested the rejection of Claims 1-10 under 35 U.S.C. § 112, second paragraph also be withdrawn.

Turning now to the rejection of the claims over the applied art. The outstanding Office Action relies on Asai et al as a primary reference in rejecting original independent Claims 1 and 2 (the outstanding Office Action relies on Nakagawa also in rejecting independent Claim 2). Applicant notes, however, that new independent Claims 11-14 and 23-41 each recite that the motor-driven system has inductors each constituted by a plurality of magnetic teeth formed at a forward end of a corresponding one of the main poles. This feature is shown in Figure 1, for example, which illustrates that each of the main poles A1-C2 of the stator 62 is provided within an inductor constituted by a plurality of magnetic teeth formed at the forward end of the main pole. That is, the inductors formed at the forward ends of the respective main poles A1-C2 are made to be in opposition to the magnetic poles of the rotor 52 (see page 12, the first paragraph).

On the contrary, the motor of Asai et al shown in Figures 14 and 15 has a stator 32 having poles with windings, an outer rotor magnet 3 and a first iron cup 31. The poles of Asai et al do not have "inductors each constituted by a plurality of magnetic teeth formed at a

forward end of a corresponding one of the main poles" as recited in the independent claims. The inductors of the present invention increase the torque of a motor as described above. Further, the first iron cup 31 in Asai et al is connected to the crank shaft 13 and does not directly drive a load that contacts an outer circumference of the cup 31. On the contrary, the outer rotating body of the present invention directly drives a load that contacts an outer circumference of the body and is different from the cup 31 of Asai et al. In addition, Figure 5 of Nakagawa discloses an outer rotor 21 with teeth in the inner circumference. However, the magnetic poles 25A, 25B ... do not have inductors as claimed by the present invention. Alternatively, the main pole includes permanent magnets 23 at the tip end (see Figure 6). A disadvantage of the construction in Nakagawa is that flux linkage between the stator and the rotor becomes lower, because magnetic flux is shorted in the main pole.

In addition, the device of Asai et al is a "magneto-generator" that is not a motor of the claimed invention. In more detail, Fig. 15 and the corresponding description (lines 9-15 of column 8) of Asai et al show that the stator core 32 is formed by "winding a capacitor-charging coil 7 on one of the pole projections and power-generating coils 9 for the load on the remaining pole projections." Because the power-generating coils 9 is a single phase coil, the generator of Fig. 15 cannot act as a motor even if voltage is applied to the coil 9. Further, although Asai et al disclose the signal generator 8 in Fig. 15 to detect the number of revolutions of the generator, Asai et al does not teach the claimed invention where positional information of a rotor in a motor-driven system is obtained to thereby obtain timing of excitation of windings.

Further, Nakagawa discloses a 3-phase stepping motor. However, because the motor of Nakagawa has a peculiar construction that is neither PM type nor HB type, it is believed Nakagawa does not teach or suggest the claimed invention.

Also, new Claims 37 to 44, which are based on the original claims 6-10, do not include the limitation of outer rotating body, but include the limitation of the inductors formed on the forward end of the main pole of the stator. As noted above, Asai et al and Nakagawa do not disclose the claimed construction having the inductors. Further, the applied art also does not disclose a phase control (original Claim 6), a position feedback control (original Claim 7), and an advanced angle control (original Claim 8) .

The basis for introducing the equation in original Claims 5-8 will now be described. The 3-phase HB type stepping motor is classified into an interphase magnetic path type and an intra-phase magnetic path type. In the interphase magnetic path type, a magnetic path is formed between the different phases. On the other hand, in the intra-phase magnetic path type, a magnetic path is formed within the single phase.

In the interphase magnetic path type, the total number of main poles of the stator is 3m. Because the main poles are arranged at regular intervals, a pitch between a phase A and an adjacent phase B is (1) 360°/3m. Assuming that the phase A is magnetized and faces to a rotor tooth RA of a predetermined magnetic pole in polarity, when the phase B is magnetized, the rotor tooth RB that faces to the phase B has an opposite magnetic pole in polarity. A pitch between the rotor tooth RA and the rotor tooth RB is (2) 360°(n±1/2)/P where n is an integer not smaller than 1. The step angle θ_s is equal to a difference between (1) and (2) as shown by an equation (3).

(3) $$\theta_s = \mp\left\{\frac{360°}{3m} - \frac{360°}{P}\left(n \pm \frac{1}{2}\right)\right\}$$

On the other hand, the step angle θ_s is also defined by (4) 180°/3P. Substituting (4) in (3) yields the equation (5) as claimed.

$$P = m\left\{3\left(n \pm \frac{1}{2}\right) \mp \frac{1}{2}\right\}$$

(5) P = m(3n±1)

In the intra-phase magnetic path type, the total number of main poles of the stator is 3m. Because the main poles are arranged at regular intervals, a pitch between a phase A and an adjacent phase B is (1) 360°/3m. Assuming that the phase A is magnetized and faces to a rotor tooth RA of a predetermined magnetic pole in polarity, when the phase B is magnetized, the rotor tooth RB that faces to the phase B has an identical magnetic pole in polarity. A pitch between the rotor tooth RA and the rotor tooth RB is (2') 360°n/P where n is an integer not smaller than 1. The step angle θ_s is equal to a difference between (1) and (2') as shown by an equation (3').

$$(3') \quad \theta_s = \pm\left\{\frac{360°}{3m} - \frac{360°n}{P}\right\}$$

On the other hand, the step angle θ_s is also defined by (4) 180°/3P. Substituting (4) in (3') yields the equation (5') as claimed.

(5') $\quad P = m\,(3n \pm 1/2)$

In the claims, since m = 2k, the equation (5') is modified as the equation (5") as claimed.

(5") $P = k(6n \pm 1)$

Further, it is respectfully submitted the other secondary references applied in the outstanding Office Action also do not teach or suggest the claimed invention.

Accordingly, it is respectfully submitted independent Claims 11-14 and 23-41 and each of the claims depending therefrom are allowable.

In addition, the specification has been amended to remove any reference to the claims. No new matter has been added.

Consequently, in light of the above discussion and in view of the present amendment, the present application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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